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GEOLOGY AND PALEONTOLOGY.

A Food Habit of the Plesiosaurs.—Mr. S. W. Williston reports finding a number of pebbles in such a position with respect to the bones of a Plesiosaur discovered in the Niobrara chalk in Kansas that the conclusion is irresistible that the stones had been in the stomach of the reptile. They had probably been swallowed to aid in digestion, a custom still in vogue among the Crocodiles. Some of the pebbles were attached by the original soft limestone matrix to the ribs and thoracic vertebræ, so that there could not be a shadow of a doubt as to the contemporaneity of deposition.

The saurian is one of the largest of the order, measuring when alive about fifty feet. The pebbles, 125 in number, are extremely hard, consisting almost wholly of silica, varying in weight from 1 to 170 grams. They are conspicuous in color, either white, black or pink, and show a great amount of abrasion, and probably came from the shores of the Benton sea.

From the uniformity of shape among the smaller ones, their number, and their color, Mr. Williston is inclined to think they were not merely water-worn pebbles, accidentally swallowed, but they had been selected by the saurian for a purpose, and that their present shape is owing to their prolonged use as "gizzard stones" in the animal's stomach. (*Trans. Kansas Acad. Sci.*, Vol. XIII, 1891-92.)

The Texas Region.—In a recent paper on the physical geography of Texas, R. S. Tarr embodies the results of his personal observation with the published geological work of others in the same region and summarizes the geological history of Texas as follows:

"The evolution of the Texas region began with an old Paleozoic or Pre-Paleozoic mountainous land which was denuded at the beginning of Carboniferous times to an old topographic form, not unlike the hilly region of southern New England. The Carboniferous beds were added to this land, by elevation, first as a costal strip, even before the end of the Carboniferous. A gathering in of shore lines formed a great interior sea, later a completely land-locked dead sea in which Permian beds were deposited; and from the close of the Permian to the beginning of the Cretaceous there was a period of denudation during which the younger Paleozoic beds were reduced to base-level and the older mountainous areas still farther degraded. A rapid subsidence lowered

the entire region below the Cretaceous sea; then at the close of the Cretaceous the land was elevated, possibly by the renewal of the mountain-building forces of the central area. The Rocky Mountain uplift caused an uptilting, raising the land still higher, and adding the Tertiary coastal strip to the Cretaceous. A later uplift added the coastal prairies and a recent slight subsidence has completed this record of change, and has given us the Texas region." (Proceeds. Phila. Acad., 1893.)

Terrestrial Submergence Southeast of the American Continent.—At the meeting of the American Association for the Advancement of Science, Madison, 1893, Dr. J. W. Spencer brought before the Society evidence of epeirogenic movements in the Antillean region, in very recent geologic times, amounting to two and one half miles of vertical subsidence of great land areas. The author's recent studies of valleys among the southern Appalachian mountains convinces him that these valleys are independent of mountain movements, and are due to erosion, either atmospheric or by running water. The valleys and channels among the Greater Antilles, and between them and the continent, are an exact reproduction of the southern Appalachian land valleys. From this analogy the author concludes that both the land and submerged Antillean valleys were of a common subaerial origin.

The submerged valleys and channels are of varying depths, the author cites examples ranging from 3,738 feet to 14,000 feet, and even in one case 20,000 feet is reached. The submergence indicated by the channels means extensive continental land-movements, which were not violent enough to obliterate the former land topography. This great continental depression diminished to the north, so that the southern states have been only partly submerged.

The great continental extension was during late Cenozoic time, if McGee's determination of the age of the Lafayette formation be accepted. The drainage of this area was largely into the Pacific, or its embayments. The watershed between the Atlantic and Pacific is still represented by the mountains of Cuba, Haiti and the Windward islands. (Bull. Geol. Soc. Am., Vol. 5, Nov., 1893.)

Tropical Miocene Fossils in Siberia.—A small collection of fossils collected by Dr. William Stimpson in northern Siberia, about 62° north latitude, on an arm of the Okhotsk sea, has been reported upon by Dr. Wm. H. Dall. The collection comprises six species of molluscs, of which five are new. In his general conclusions the author

remarks that "formally the species point to a distinct analogy with those of the China and Japan seas, and like the existing fauna of those seas, they indicate bonds of relationship with the west coast of Africa and the coast of Australia."

The matrix of the fossils determines them to be of Miocene age, and as the fauna indicated by them lived in waters as warm as the Japan sea, the annual mean temperature of the Okhotsk sea in the era in which these fossils flourished must have been about 60° F., a difference of 30° to 40° F. from that of the present time. (Proceeds. U. S. Natl. Mus., Vol. XVI., 1893.)

Arctic Geology.—According to Sir Henry Howorth the Arctic lands, during the Pleistocene period, instead of being overwhelmed by a glacial climate, were under comparatively mild conditions. Since Pleistocene times the climate has been growing more and more severe. The author bases this conclusion on a study of the Arctic flora as displayed in Greenland, Spitzbergen, and the uncovered moraine of the great glacier in Alaska, and also upon certain faunal facts. He cites evidence to show that the present flora of Greenland is undoubtedly a relic of an old flora which has survived in favorable localities, and not an importation since Glacial times. The same is true of the Spitzbergen flora. The discovery of a colony of sea-cows on Behring's Island seems to indicate a recently milder climate in that region. The peculiar types of northern migratory birds suggests that at no very remote period they lived the year round in their present breeding places in Northern Siberia, Greenland and Spitzbergen, and that it is the present ever increasing cold that leads them to migrate in search of warmth and food. In short, the only Glacial climate we are warranted in supposing to exist in the Arctic lands is that which is now current, and it is the product of changes in the level of the earth's crust since Pleistocene times. (Geol. Mag., Nov., 1893.)

An Extinct Lemuroid from Madagascar.—At a recent meeting of the Royal Society of London Dr. Henry Woodward read a communication from Mr. Forsyth Major concerning a huge fossil Lemuroid from Madagascar, to which we referred in the Nov. number of the *NATURALIST* (p. 1002). The following report is given in *Nature*, July 20, 1893.

"It is now forty-two years since Geoffroy Ste-Hilaire announced to the French Academy of Science the discovery of gigantic eggs and a few bones of *Æpyornis* from superficial deposits in the Island of

Madagascar, anticipating that a rich fauna of extinct vertebrata would be speedily forthcoming. Little has, however, been added to our knowledge since 1851 to the present time. In addition to the remains of a Crocodile, two Chelonians, and a Hippopotamus, first discovered by Grandidier, the number of distinct forms of *Æpyornis* is now rapidly increasing, and promises to rival in variety the New Zealand species of *Dinornis*, whilst the disclosure of a rich mammalian fauna seems only waiting to reward the carrying out of systematic exploration.

"Four collections of sub-fossil vertebrates, from various regions of Madagascar, have recently been acquired by the British Museum of Natural History. Amongst one of these sent over by Mr. J. T. Last is a somewhat imperfect skull of strange appearance obtained with numerous fragmentary Chelonian, Crocodilian, Hippopotamus and *Æpyornis*, remains from a marsh at Ambolisatra on the southwest coast of Madagascar. For this remarkable fossil Dr. Major proposes the name *Megaladapis madagascariensis*, and the establishment of a distinct family of the sub-order Lemuroidea, of which *Megaladapis* appears to be a much specialized gigantic member, being approximately three times the size of the cranium of the largest existing Lemurid.

"The salient features of the skull are the enormous lateral development of the anterior inter-orbital portion of the frontals, extending over the small, thick-walled tubular orbits. The post-orbital frontal region is comparatively narrow and elongate, and separated by a slight contraction from the equally narrow parietal region, bearing a thick and flattened sagittal crest. The brain-case is low, short and narrow, and placed at a considerable higher level than the elongate facial portion. Both the cranial and facial portion are somewhat bent upwards, the former posteriorly, the latter anteriorly. A striking general character is the remarkable pachyostosis (thickening) of the cranium.

"The author points out that, in its peculiar features, this skull only carries to an extreme, characters which are present, but in a much lesser degree, and in varying gradations, in the different members of the Lemuroidea, both recent Lemuridae, and extinct Adapidae. In the very simple pattern of the molars, the superior of which are of the pure tritubercular type, *Megaladapis* approaches closely to the Malagasy Lemurides, *Lepidolemur*, and still more to *Chirogaleus*.

"The diminutive size of the brain-case (comparable only with what we find amongst the Marsupialia and the Insectivora) is viewed by the author, in this instance, as a degeneracy, other characters being equally indicative of a retrogressive evolution undergone by this Lemuroid.

"It is strongly insisted upon, generally, that 'low' organization in Mammalia is by no means always synonymous with 'primitive' organization, and that retrogressive evolution is more frequently to be met with amongst Mammalia than is generally admitted.

"As regards the geological age of *Megaladapis* and its associated fauna, one of whose members the *Crocodylus robustus*, is still living in the lakes of the interior, evidences of various kinds goes far to prove that these sub-fossil remains represent a fauna which was living at a comparatively very recent period, and that man himself was contemporary with it, and in part responsible for its destruction.

"The author adduced evidence in support of the proposition that an older Tertiary vertebrate fauna will ere long be forthcoming in Madagascar."

Geological News. General.—In a brief report on the organic remains obtained from a deep well near Galveston, Texas, Mr. G. D. Harris compares the fossil shells with the recent ones of the Atlantic and Pacific shores of America and the fossil faunæ of the Atlantic slope, including that of the West Indies. The relationships are shown in a bathymetric table. The collection comprises 77 species, of which 20 are new. In addition to the marine forms enumerated in the table, the following fresh water species were obtained: *Polygyra hindsii* Pfr., *Amnicola*, not distinguishable from *peracuta*, and a *Planorbis* allied to *P. vermicularis* from the Lake of the Woods. (Fourth Ann. Rept., 1892, Geol. Surv., Texas.)

Paleozoic.—A new gasteropod, *Loxonema winnipegense* from the Trenton limestone of Manitoba is described and figured by Mr. J. F. Whiteaves. The author considers it of interest on account of its strikingly close similarity to some of the most typical Jurassic species of *Pseudomelanæ*. (Canadian Rec. Sci., 1893.)

In regard to the use of the term "Catskill," Mr. J. J. Stevenson avers that, in nine-tenths of the area in which this series is exposed within the Appalachian Basin, the Chemung is the important portion of the series. Catskill is simply epochal but "Chemung" carries with it the conception of those physical and biological characteristics which mark the closing period of the Devonian. For which reasons, Chemung should be used to designate the whole group, retaining Catskill in its original and local signification only. (Amer. Journ. Sci., Nov., 1893.)

Mesozoic.—In a contribution to the "Invertebrate Paleontology of the Texas Cretaceous," Mr. F. W. Cragin describes 168 species dis-

tributed as follows: Cœlenterata, 1 sp. nov.; Echinodermata, 32, of which 17 are new; Molluscoidea, 2 sp. nov.; Brachiopoda, 1 sp. nov.; Mollusca, 132, of which 82 are new. The text is illustrated by 46 plates of drawings, some of which were made by the writer. (Fourth Annual Rept., 1892, Geol. Surv., Texas.)

The discovery of fossil Cretaceous plants at Glen Cove, and various other localities in Long Island, by Mr. Arthur Hollick, together with the collections made by Mr. David White in Gardiners Island, Block Island, Center Island and Marthas Vineyard, have enabled Mr. Hollick to trace the continuity of the cretaceous strata from New Jersey through Staten and Long Islands to Marthas Vineyard, and to demonstrate beyond question that the theory of Mather and subsequent observers in regard to the eastward extension of the cretaceous formation was correct, and emphasizes the probability that certain limited areas of the New England coast could also be referred to that horizon. (Trans. New York Acad. Sci., Vol. XII, 1893.)

Two new forms of the Pycnodont genus *Anomœodus*, *A. superbus* and *A. willetti* from the upper English Cretaceous are described by A. Smith Woodward. This genus was described by Forir, but his definition was based solely upon the arrangement of the splenial teeth. The new material enables Woodward to make the definition more satisfactory. In the same paper the author describes the splenial dentition of two new species of *Cœlodus*, *C. inaequidens* and *C. fimbriatus*. (Geol. Mag., Nov., 1893.)

In some notes on a few fossil leaves from the Fort Union group of Montana, Mr. F. H. Knowlton describes a new species, *Populus meedsii*, evidently related to *P. heerii* Sap. from the Eocene at Florissant, Colorado, and which has for a living analogue *P. angustifolia* James, a species living along streams from New Mexico and Colorado to California and Washington. (Proceeds. U. S. Natl. Mus., Vol. XVI, 1893.)

Cenozoic.—In a study of the rocks of Carmelo Bay, California, Mr. A. C. Lawson finds no evidence for Whitney's statement that Miocene rocks are here invaded by a mass of granite. The rocks, consisting of sandstone and shales, are probably Eocene, and rest upon a worn and eroded surface of granite. The supposed metamorphic rocks are laminated volcanic flows. Miocene formations are abundantly developed but do not extend down to the shores of the bay. (Bull. Univ. California, Vol. I, 1893.)

Mr. R. A. F. Penrose records the discovery of a Plistocene manganese deposit near Golconda, Nevada. The ore occurs as a lenticular mass in a soft calcareous tufa, and probably represents a local precipitation from spring waters. The position and nature of the ore show that the bed was laid down in shallow water and subsequently covered over by a tufa deposited from the supersaturated lake water. (Journ. Geol., Vol. I, 1893.)